REMARKS/ARGUMENTS

Claims 1-13 and 16-20 are pending in the application.

Claims 1, 2, 5, 8-13 and 16-19 stand as being Finally rejected with the rejection being based on 35 U.S.C. 103(a) in view of the reference patents of White, U.S. 5,233,551 (herein White) in combination with the reference patent U.S. 5,963,164 of Tsui et al. (herein Tsui et al.). Claims 1-9 are also rejected under the provisions of 35 U.S.C. 112 in view of a one word ambiguity question and with claims 3, 4 and 6, 7 of this group being allowable with correction of the 35 U.S.C. 112 question. Claims 14 and 15 are also indicated as allowable if rewritten to include the contents of related independent and base claims.

In response applicants herein amend independent claim 1 to overcome the rejection under 35 U.S.C. 112 and also to overcome the 35 U.S.C. 103(a) rejection. Applicants also present remarks of reasoning and argument based on extended inventor and attorney conversation and new appreciation of differences between applicants' invention and the invention of the White reference patent.

With respect to this White reference patent it now appears even more clear that the sole intention of the White invention is to realize a radix 12 (i.e., 12 point Fourier transformation) signal processing in a multiplication-minimized and even multiplication-eliminated, energy efficient manner--a manner combining two point Fourier transformations and six point Fourier transformations, as is indicated for example at White column 3, line 10; column 3, line 28; column 5, line 40 and column 4, line 65. In accomplishing this realization the White patent specification commences with a largely theoretical and mathematical substantiation of the decomposition process used to achieve a multiplication reduced or multiplication-free Fourier transformation.

A notable part of the White signal processing involves the incorporation of signal phase adjustment processing circuits identified as "twiddle factor" elements. The description of this processing itself commences at column 10, line 14 of the specification. The White "twiddle factors" are formally identified as "phase–shifting complex-weighting coefficients" and are identified with the symbol W commencing at column 6, line 54 of the White specification. Generic mathematical definitions of a "twiddle factor" are disclosed at (1) in the column 6, line 56 White location and also at column 11, line 65; column 12, line 1; column 12, line 13 and in TABLE II at column 12, line 40. Mathematical expressions for two specific "twiddle factors" appear at column 7, line 47 and column 7, line 61. A block

diagram description of White employed "twiddle factor" circuits commences at column 13, line 27. Five differing twiddle factor circuits are shown in the FIG. 9 through FIG. 13 White drawings and usage of such circuits occurs at 20-28 in the FIG. 7 and FIG. 14 drawings.

Notably both the identified mathematical expressions and the "twiddle factor" circuit embodiments each involve some plural combination of addition, subtraction multiplication and division of real and imaginary signal components; i.e., signal processing that is mathematically precise in nature. In view of the contents of the several "twiddle factor" mathematical equations and the contents of the equation realizing circuits in FIG. 9 –FIG. 13 the White "twiddle factors" are clearly not of an approximated nature. Moreover these approximation-free "twiddle factors" do not define approximated Fourier transformation Kernel function locations as are referred-to in applicants' rejected claims.

A related topic of current relevance concerns a recurring need encountered in the White processing for a factor or signal identified as gamma (γ), a signal involving a mathematical square-root of three, $\sqrt{3}$, factor, see White FIGs. 7, 9, 11, 13 and 15 as well as column 4, line 20 and numerous other locations in the White specification. This $\sqrt{3}$ factor is used in plural locations when realizing the "twiddle factor" circuits as is explained commencing at column 12, line 13 of the White specification. Use of the $\sqrt{3}$ factor in a Fourier transformation enables a simplification of the multiplication to be embodied in the Fourier transformation, see column 12, line 30 in the White specification. In many White signal processing situations a digit shifting operation can be used in lieu of this multiplication so that a multiplication-free embodiment of the White Fourier transformation is enabled with use of the gamma factor as is explained at column 12, line 51 of the White specification.

The White Fourier transformation processor therefore includes a mathematical series based approximation realization of the $\sqrt{3}$ gamma factor as is shown in the White equation at column 12, line 66 and as is embodied in the FIG. 15 drawing. A description of the FIG. 15 circuit is located at column 13, line 5 of the specification. Notably this FIG. 15 mathematical series based approximation is achieved also using the mathematically precise steps of addition and subtraction of signals, signals involving a limited number (i.e., 6) of exponential powers of two between 2^1 and 2^{15}. (Also note the presence of the + and – signs applied at the input of adders 115, 117 and 119 in White FIG. 15.) Significantly the only approximation nature in this gamma signal realization or elsewhere in the White patent

resides in the imperfect mathematical equality of a realization achieved with a finite six term mathematical series versus the actual magnitude of the desired √3 irrational number; i.e., 1.7320508---etc.--a magnitude that is an infinite number sequence in reality. Any embodiment of such a number is inherently an approximation to some degree however such an infinite number approximation does not teach the approximated Fourier transformation Kernel function as is disclosed in applicants' specification and recited in applicants' rejected claims.

The purpose of the approximated gamma related factor in the White invention is stated at column 12, lines 30-36; this purpose is for simplification and convenience, an enabling of embodying fewer multiplications in the White process. In fact with use of the gamma factor the White process can be embodied solely with shift operations, column 13, line 2. Applicants respectfully submit that this White reduced multiplication prompted approximation is totally distinguished from the approximation of Fourier transformation Kernel function locations of the present invention.

The Examiner has referred to the White FIG. 5 drawings on multiple occasions in the course of the present exchange. On page 10 of the Final Rejection action it is for example asserted that this FIG. 5 drawing discloses Kernel function optimization with respect to radio receiver spurious response characteristics achieved. Applicants however find no recitation of either radio receiver, spurious response, approximation or optimization of Kernel function in connection with the FIG. 5 drawings. These drawings are instead concerned with a defined new "w"-inclusive coordinate system, a skew–complex, non-orthogonal coordinate system as explained at column 9, line 2 and column 10, line 2. As also described at column 5, line 17 the FIG. 5 drawings illustrate relationships between axes for the four different radix systems discussed in the White specification. None of this disclosure however teaches the approximated Fourier transformation Kernel function disclosed in applicants' specification and recited in applicants' rejected claims.

In applicants' invention moreover the magnitude of the Fourier transformation Kernel function is approximated with convenient Kernel function coefficient values many of which lie in an annular arc but off of the Kernel function circle shown in applicants' FIG. 2, FIG. 3, FIG. 4 and FIG. 5 drawings. No such Kernel function locations are disclosed in the White reference. No annular arc disposition of Kernel function locations are shown in the White reference. Each of the White Kernel function circle inclusive drawings, FIG. 5 and FIG. 8, shows Kernel function locations lying precisely on the illustrated circle. This is

significant. Significant because applicants' invention has approximated one factor in a Fourier transformation embodiment while the White invention has if anything approximated a totally different factor. Applicants have approximated what may be viewed as a geometric position of a Fourier transformation Kernel function factor while the White reference has approximated a numeric magnitude, a magnitude useful for simplification purposes in a particular Fourier transformation realization but not connected with a Fourier transformation Kernel function. Each of applicants' independent claims now in fact includes annular or different radii Kernel function radius descriptions expressly distinguishing over the single radius shown in the White reference.

Applicants invention has extended further to consider the number of approximated Kernel function locations employed in a Fourier transformation and the effect of Kernel function number and radial location and angular separation around the circle on such signal processing considerations as radio receiver dynamic range and spurious response characteristics. These considerations are also totally absent in the White reference.

With respect to the rejected claims of the present application and the Office Action comments relating to these claims, each of applicants' rejected independent claims, claims 1, 10, 19 and 20 recites the approximated Fourier transformation realization including use of this recitation in plural claim locations. Applicants have discussed the present context improved meaning of such approximated Fourier transformations especially in the FIG. 3, FIG. 4 and FIG. 5 drawings and in the related specification text located in paragraphs [0051], [0054], [0055] through [0059] and [0062] for examples. Nothing identified in the White reference has however disclosed the use of approximated coordinate magnitudes and angle magnitudes in the real-imaginary plane representations of Kernel function realizations. Notably the "twiddle factor" in the White Kernel function is identified as a phase shift consideration not an approximation, and is a mathematically precise value rather than approximation value as is discussed above herein.

The Examiner appears however to have glossed over this express approximation recitation on numerous occasions during this exchange. Applicants' claim language has been reproduced in the Office Actions including this approximation recitation on multiple occasions without due consideration of the meaning of this limitation or realization that such arrangement is not present in the White reference. The White column 8, line 50-62 language relied upon repeatedly in the Office Actions is concerned with inter alia term definition and embodiments for a radix 2 Fourier transformation but does not disclose an

approximation, especially not a Kernel function coefficient approximation. As described above the only possible approximation found in the White patent is concerned with the numeric value of a Fourier transformation simplification factor or convenience factor, i.e., the quantity gamma. This White approximation simply does not meet the approximation of Kernel function radius and angular position arrangements described in applicants' specification and recited in the rejected claims. In the Office Action the Examiner appears to expand the White reference beyond the bounds of its express disclosure in order to substantiate the rejection of applicants' claims.

With respect to the Examiner's Action reply concerning a 256 point Fourier transformation there yet appears no sound rejection of the detailed Fourier transformation numeric points range limitation recited in rejected claim 8 of the application. The White reference is as noted above focused on a 12 point Fourier transformation and the smaller point decomposition arrangements usable to realize this 12 point transform.

With respect to applicants' previous reply page 10 argument concerning twiddle factor and square root of three considerations it appears the thrust of applicants' destruction of reference invention function if combined as asserted in the Office Action was misunderstood. Prior case law appears to accept the point that both intended and unintended consequences of an asserted reference combination merit consideration in determining the appropriateness of a 35 U.S.C. 103(a) combination of reference documents. In the case of the White and Tsui et al. references such unintended consequences appear undesirable as previously noted.

The dependent claims of the instant application are respectfully submitted to be carried as to patentability by at least the parent independent claim considerations discussed herein.

In conclusion applicants again respectfully submit that the present invention rejections based on 35 U.S.C. 103(a) and the White and Tsui et al. references are less than well founded and are hence appropriate for reconsideration. Such reconsideration and allowance of the thusly rejected claims are respectfully solicited.

Turning to the specific claim changes submitted herein applicants have canceled claim 3 in the application and added the Kernel function circle limitation of this claim to the language of rejected claim 1. Claim 1 now also includes the within and external of a Kernel function magnitude circle concept discussed herein. Claim 1 additionally includes a last paragraph revision correcting use of the word "can". The language of the third paragraph

in claim 19 has also been modified slightly to emphasize the approximated Kernel function concept.

Applicants have noted the Office Action indicated allowable status of six dependent claims in the application. In response to a belief that additional and independent claims of the application are also now in reasonably allowable condition, applicants elect to presently maintain the application in its unified state.

In view of the "After Final Rejection" status of the application, applicants understand the Examiner has available options ranging between "Allowance" of the application and affirming/maintaining the "Final Rejection" with little comment in an advisory action response to the present submission. Applicants respectfully request at least an admission of the present response into the application record in response to filing of a notice of appeal in order to clarify the status of the Ex parte exchange in the record.

Especially in view of the herein added claim language distinctions and new remarks of distinction over the primary White reference patent, a reconsidered allowance of all claims in the application and passage to issuance are respectfully solicited.

Respectfully submitted,

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